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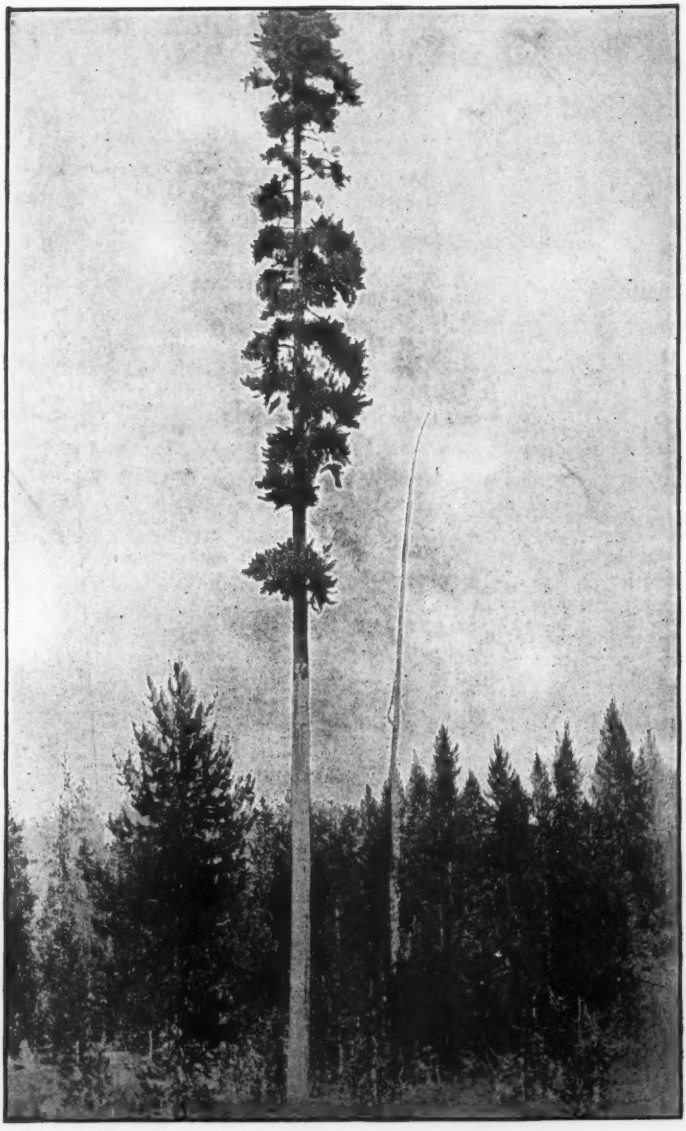
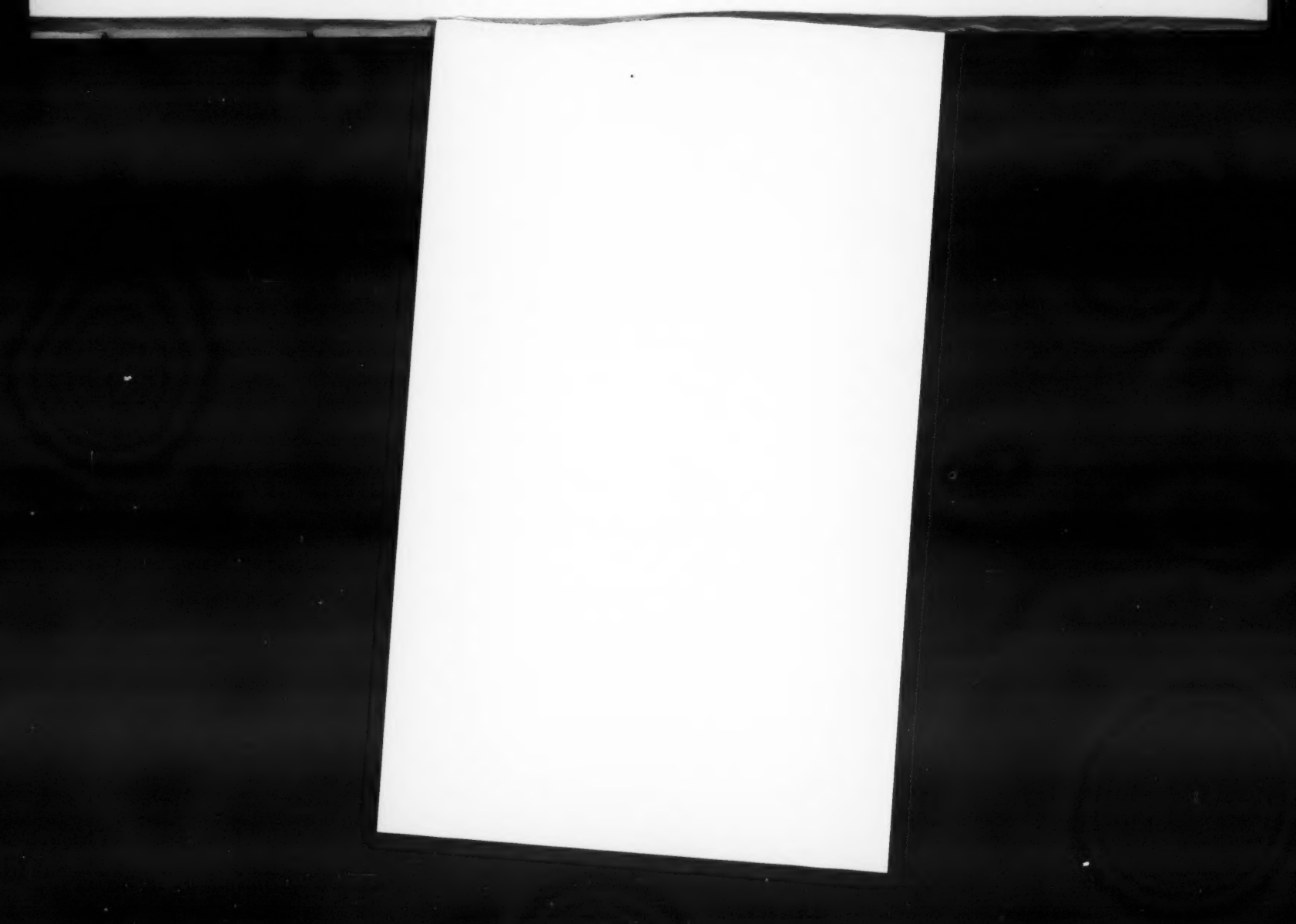


ORDINARY MOUNTAIN FORM OF LODGEPOLE PINE.

SPECIAL NOTICE.

The American Forestry Association will not meet at Colorado Springs, as announced in the columns of this issue, owing to the postponement of the meeting of the National Irrigation Congress. The Association will, however, meet in affiliation with the American Association for the Advancement of Science at Denver, Colorado, August 27th to 29th, inclusive. Announcement of meeting will be issued later.

OTTO J. J. LUEBKERT.



THE FORESTER.

VOL. VII. MAY, 1901. No. 5.

THE STUDY AND PRACTICE OF SILVICULTURE.

BY HENRY S. GRAVES.

Director of the Yale Forest School.

FORESTRY is generally called a science. The terms, scientific forestry, scientific lumbering, scientific forest management, and the like, are in common use, but probably most persons do not have a clear conception of how far forestry is a science in the true sense of the word.

Forestry is a science in that its practice is based on scientific facts and principles, but it is essentially an art and a business.

The fact that forestry is scientific has proved a serious obstacle in the way of its adoption by many forest owners in this country. Lumbermen have a strong prejudice against scientific foresters, for they believe that the latter are theorists and that they can offer nothing practical. This prejudice has been strengthened because many men, who have learned something of the science of forestry from books, but who have no clear idea of the economic conditions which the practical lumberman must meet in marketing his timber, have made recommendations to private owners which are absurdly impractical and which a forester, who understood his business, would never have made.

The real nature of forestry has been misunderstood, not only by lumbermen, but also by many persons who call themselves foresters. Some who have understood the laws governing the life of trees have believed themselves competent foresters, although they had no thorough knowledge of the art of tending or reproducing forests, or the business part of forestry. Others who have understood the art of establishing woodlands by planting or otherwise and of tending woodlands, have failed because they disregarded financial considerations. And still others, who have understood the economic conditions of the country, have not succeeded because they have not had a thorough knowledge of the life of trees and forests, and in consequence have been unable to devise correct systems of treatment.

Forestry is really a branch of botany. Botany is the science of plants. There are a number of branches of botany of sufficient importance to be called sciences in themselves. Thus agrostology is the science of grasses, a group of plants. It is a branch of botany. Dendrology is the science of trees, a group of plants. It is a branch of botany. Forestry is the science of forests. It is a branch of botany.

But what is the difference between forestry and dendrology? The chief difference is that the dendrologist's work is for scientific purposes alone, while forestry is an applied science. But the facts upon which the practice of forestry is based, are really an extension of dendrology. The dendrologist studies trees, chiefly for the purpose of identification and classification. Whatever study he makes of the habits and life of trees is usually general in character and is confined to the individual. The forester goes further and

(From Year Book for 1899 U. S Dept. of Agriculture.)

CONSERVATIVE LUMBERING. A LARGE OAK CUT AND WORKED UP INTO CORD WOOD WITHOUT INJURY TO THE SAPLINGS ABOUT IT. BILTMORE, N. C.

studies the life of trees as they occur in groups. He studies the individual as it forms a part of the whole forest. He studies the influences, which affect the development of trees, and he studies their behavior under different conditions. In other words, studies the life of the forest. This knowledge is classified and arranged in a system. It is the science upon which the whole practice of forestry is based. The forester has taken up dendrology and extended it. He has appropriated the knowledge and embodied it into the science of silviculture.

As ordinarily defined, silviculture is the establishment and care of woodlands. It is the art of establishing plantations by seed or by planting. It is the art of tending forests, of thinning them for the improvement of their character and composition, of pruning, when practical, and of removing the timber in such a manner that reproduction will take place by natural means. In the popular mind this is the practice of forestry. It may be better called the practice of silviculture, as distinct from the science of silviculture, which I would define as the whole body of observed facts having to do with the life of the forest.

Silviculture teaches how to produce forests. It is silviculture that distinguishes forestry from ordinary lumbering, and most lumbermen think that silviculture and forestry are identical. This idea is natural, especially in view of the fact that a number of experiments, to demonstrate practical forestry, have been made in this country which are really demonstrations of practical silviculture and not of practical forestry.

WASTEFUL METHODS OF LUMBERING NEAR HILL CITY, SOUTH DAKOTA.

I repeat that forestry is an art and a business whose practice is based on scientific facts and principles. The practice of silviculture is the art of the forester. Here he can show his knowledge of the life and

requirements of trees and can demonstrate his skill in moulding forests into such a shape that the greatest amount of the most valuable material will be produced in the shortest possible time. But it is the business side of forestry, forest management, which makes this knowledge and skill of value and practical utility. A demonstration of silviculture, which pretends to be a demonstration of practical forestry, but which makes financial considerations of incidental interest alone, does an injustice to forestry, especially at this time when the science is on trial as really practical for business men.

SOFT MAPLE FOREST PLANTATION, TWELVE YEARS OLD, IN PALO ALTO COUNTY, IOWA. TREES TOO FAR APART TO KEEP OUT THE GRASS. SHOWS A FAILURE IN TREE PLANTING DUE TO LACK OF SILVICULTURAL STUDY.

Experiments in silviculture are of great value and are very much needed in this country. We know extremely little about the life of our trees and every encouragement should be given to experiments which teach how to handle them. But they should be understood as experiments in silviculture, made to increase our knowledge of the silvicultural treatment of our forests, and not as demonstrations or examples of practical forestry.

Nothing would delight the forester more than the opportunity to base the management of his forest upon silvicultural considerations alone. He could produce in the end a very complete forest. But this can be done only on experimental tracts.

In the countries where forestry has been

practiced for many years, systems of management have been developed which suit the local economic conditions. The measures, which the forester as a silviculturist would like to use, are modified by financial considerations. The silviculturist must expect always to fall short of his ideal. He must always make some sacrifices and his final method must always be a compromise between what would produce the most perfect results silviculturally and what is possible for the owner financially.

"LUMBERING APPROACHING FORESTRY. MANY SMALL TREES LEFT. SAPLINGS CUT TO STREW ROAD WORST FAULT."

If that is true abroad, it is a much more important fact in this country. The forest owners demand more here than abroad. The market generally allows the cutting of only a limited class of timber, prices are low, labor is high, freights are high, roads are poor or wanting, and danger from fire and trespass is very great. These conditions necessitate a greater sacrifice on the part of the silviculturist here than in Europe. The forester who expects to accomplish at once the results secured in Europe will fail. The American forester must devise systems of management which will accomplish the owner's object and at the same time maintain the productiveness of the forest. It may take him some years to perfect his systems, and he may have to use makeshifts at first. But if the methods are correct, they will develop with the changes of economic conditions and the change of public opinion. No greater mistake can be made than to assume an uncompromising attitude in the face of financial considerations and public opinion and to insist that measures must be used which involve more money than the owner can afford to expend.

Forestry always costs something. It may involve an investment in the form of mer-

chantable trees left for the production of seed or as soil cover, or it may involve the expenditure of money for marking timber, for protection or for planting. But the forester has no right to advise the expenditure of a single dollar unlsss he can show that it is necessary.

Often tree planting on a large scale is recommended where the conditions of natural reproduction have not been studied at all. A forester should never advise the expenditure of money for planting unless he can show that the returns on the invested capital will be greater than by waiting for natural reproduction, or give a reason equally good.

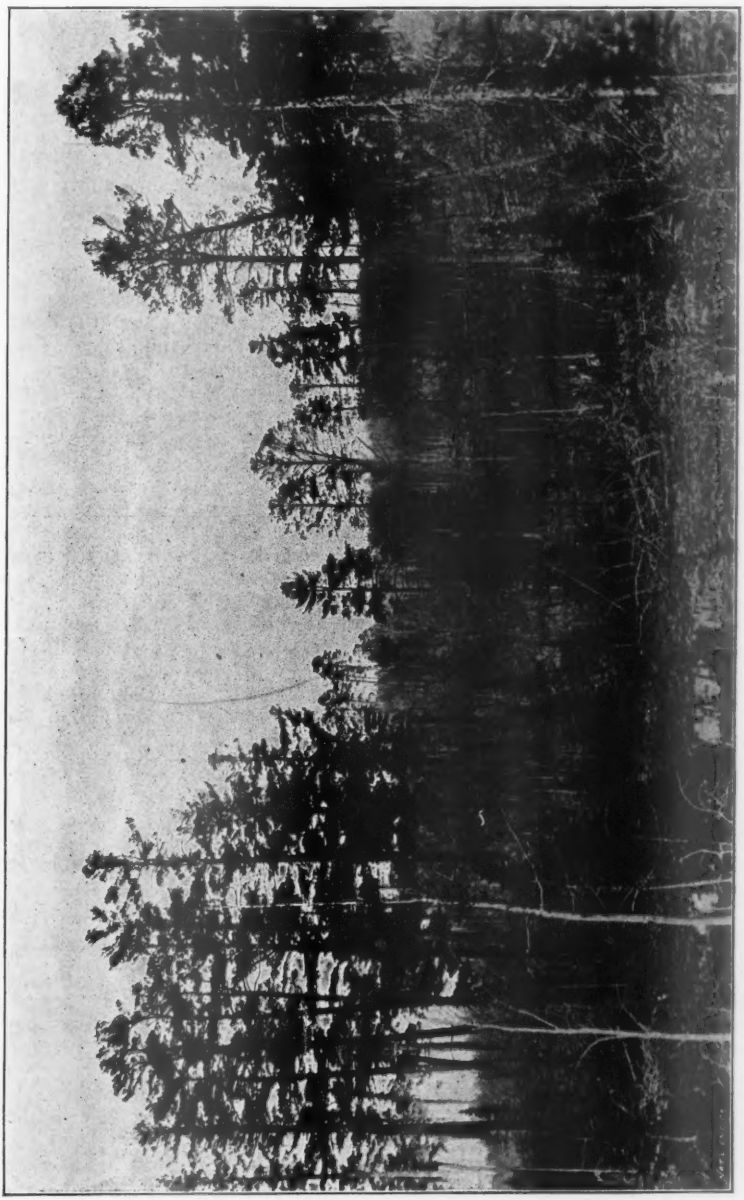
In many sections of the country the methods of practical forestry will not for the present differ very radically from the methods of the careful lumberman. The silvicultural methods, which can be used in most of the spruce forests of Maine, will not at first be very different from those already in use by certain farsighted lumbermen. But the fact that lumbermen have been clever enough to use systems of practical forestry without the advice of scientific foresters is no reason why these methods should not be classed as true forestry.

The fact that our conditions are rough and that our silvicultural methods must be at first crude, has caused a tendency among some American foresters to underestimate the value of a thorough knowledge of the practice of European silviculture and of the importance of silvicultural study in this country. Some have shown a tendency to study the questions of exploitation and other subjects of forest management alone and to consider silvicultural study, except as it has to do with growth and yield, merely of scientific interest.

Forest management in most parts of the country has for its first object the removal of the merchantable timber in such a way that the productiveness of the forest will not be impaired. No person is in a position to accomplish this object who does not have a knowledge of the methods of forestry used elsewhere and who does not have an intimate knowledge of the silvicultural character of the forest which he is handling.

The American forester will have to use considerable ingenuity to devise systems of management which will accomplish his purpose, and he will be able to devise them only when he understands the requirements of every species in the forest which he is treating. A forester who neglects his silvicultural study is apt to use some system of management with which he is already familiar. In order to justify the use of any system a second time he must study the forest with as much care as if he were introducing an entirely new method of management. The silviculturist should get into the closest touch with the needs of the different trees under all circumstances. He should study the reproduction of each species, obtaining information relative to the production of seed, the amount produced and the frequency of seed years, the conditions most favorable to germination of seed, the requirements of the seedlings with regard to light, soil moisture, effect of wind, frost, fire, etc. He should study the requirements of every tree at each period of its life with respect to every influence which affects its development. The forester should carry on his silvicultural study according to a systematic plan and not rely on haphazard observations. Unfortunately, most of the silvicultural observations which have been gathered about our trees have been made when merely passing through the woods. This is very well when the lack of time prevents further study, but where a working plan is made and a new system of treatment is developed, the silvicultural study ought to be backed up by data collected in a systematic and scientific manner. And when the final method is evolved the forester should have a clear notion, based on comparative observations, of what will take place when the forest has been treated. He should know how each tree will develop, presupposing that there are no disturbing conditions, and should be able to prophecy, so far as this is ever possible, what the character of the reproduction will be.

The forester should have an intimate



"SEED TREES IN BURN. NO NECESSITY FOR PLANTING."

knowledge of the growth and production of forests under different conditions. The growth is of great importance in the silvicultural treatment of trees. With some trees the rapidity of growth is the factor which enables them to maintain their position in the forest. The relative rate of growth must always be considered in creating mixed forests and is one of the important characteristics which the tree planter has to know.

A knowledge of the production of forests is used chiefly in problems of management. In making a working plan such information is absolutely necessary. Where planting is done the owner must know how soon he may expect some returns and whether they will be enough to cover the initial outlay. Empirical and normal tables of yield for even aged forests are, therefore, of the greatest value. Most of our forests will be managed according to some system of selection. It is just as important in this case for the owner to have a knowledge of future production as when a forest is planted. The owner must know how much timber can be cut at present, and how much can be cut in the future. This information should be gathered and presented in tables of yield. Our forests are very irregular, and prophecies of future yield can at the best be only approximations. Where possible they should always be founded on the growth of trees which are grown under conditions like those which will prevail under the new system of management. It is nearly always possible to find such conditions, but if they cannot be found, the growth of virgin trees must be used. The figures will certainly be conservative, for the growth is slower than under new conditions of light after lumbering. Such tables of growth should be made for different localities wherever possible and, of course, for all forests under different systems of management.

The forester must take the conditions which he finds at hand. The fact that he cannot determine the future growth with mathematical accuracy is no reason why he should not determine the facts as accurately as possible. Some working basis he must have and it is perfectly legitimate and scientific to take the best figures which can be obtained, and to use them until empirical tables can be made. Let no person make the mistake that a scientific study of the forest is unnecessary in this country. Every system of management which is not based on such study will fail. And the successful forester will be the man who appreciates that the study of the science of silviculture and the practice of silviculture go hand in hand.

AN EXAMPLE OF SLOW GROWTH OF LODGEPOLE PINE.

By C. S. Crandall.

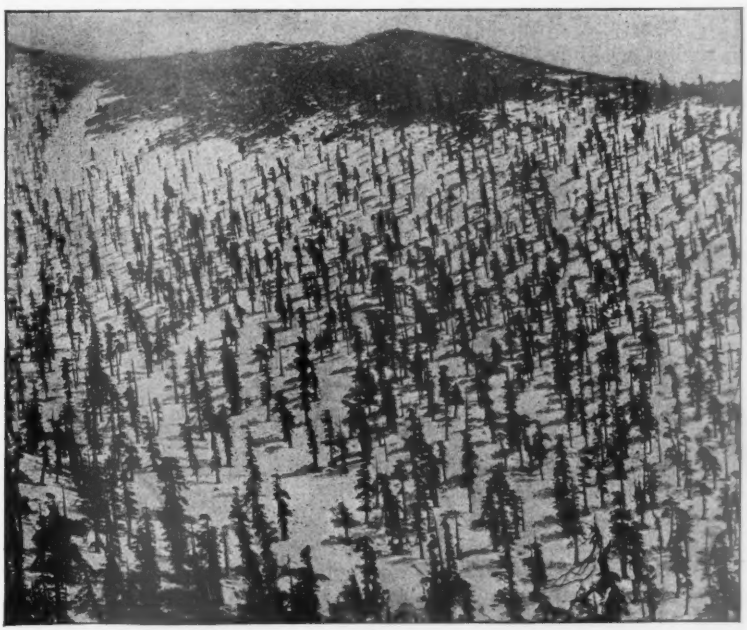
Division of Forestry.

THE southern extension of the Lodgepole Pine in the Rocky Mountains covers the full width of Colorado and occupies large areas between altitudes of 7,000 and 10,000 feet. Owing to its aggressiveness in taking possession of lands on which other species have been killed by fire, the Lodgepole Pine is gradually increasing its holdings. This ability to reclothe burned areas is a valuable characteristic of the species and it may be depended upon to perpetuate forest cover on many acres that might otherwise remain treeless.

All species of the mountain region are of slow growth because the conditions are semi-arid, but no species shows such extremes in rate of growth, and such persistence under adverse conditions as does the Lodgepole Pine. Trees in moist situa-

tions and not crowded by near neighbors may develop with reasonable rapidity, as is shown by an example taken from a mountain slope at an elevation of 9,500 feet. This tree at the age of 52 years was 42 feet high, 12¾ inches in diameter, breast high, and had added the last inch to its diameter in a period of five years.

This development, however, must be regarded as exceptional. The stand of the



SLOPES ON NORTHERN SIDE OF GRAYBACK RANGE, SAN BERNARDINO FOREST RESERVE, CALIFORNIA, BEARING LODGEPOLE PINE AND LIMBER PINE. ALTITUDE 11,000 FEET.

species is usually dense, and much of the area it occupies consists of mountain slopes or elevated plateaus where the combination of excessive dryness and close crowding admits only very slow development as the following example will illustrate:

An acre of ground on the gently sloping top of a mountain ridge at an altitude of 9,500 feet carries 773 Lodgepole Pine and three Douglas Fir trees, having diameters of four inches and over at breast height. Of smaller trees there are 184 Lodgepole Pine and one Balsam, and of small seedlings two Douglas Fir, one Balsam, one Engelmann Spruce, three Aspen and two Willow. There is no other vegetation except a few small patches of the low mountain huckleberry (*Vaccinium myrtillus*) and a few plants of Prince's Pine (*Chimaphila umbellata*). The dead trees on the acre number 293, 85 of which have fallen; these all belong to the same generation as the living trees, and represent, in part, the natural thinning through crowding.

Ninety-two per cent. of the 773 Lodgepole Pine trees fall below ten inches in breast-high diameter, and only two per cent. reach twelve inches and over. From six selected sample trees, it is found that

TYPES OF YOUNG LODGEPOLE PINE GROWTH ABOUT 20 TO 25 YEARS OLD.

OLD BURN IN LODGEPOLE PINE FOREST ON LOWER SLOPE OF SLEEPING CAP MOUNTAIN. SHOWS REPRODUCTION OF SAME SPECIES FROM CONES ON FIRE KILLED TREES.

the average diameter, breast high, is 8½ inches; the extremes of height are 37 and 54 feet, with an average of 44 feet. Ages range between 150 and 163 years, with an average of 154 years.

BURN OF 1889 ON BLACKFEET RESERVATION, NEAR MIDVALE, MONTANA. DENSELY RESTOCKED WITH LODGEPOLE PINE.

Comparing the averages of diameter and age is enough to show the present rate of growth. It is found that at 50 years the average tree has acquired a diameter of 5.3 inches, or about 62 per cent. of the present diameter; and at 100 years of age it has 86 per cent. of the diameter at 154 years. This shows the annual increment of the later years to be very small.

Counting the annual rings from the outside, the tree of most rapid growth includes 25 in the last inch added to its diameter; the tree of slowest growth includes 75 rings, and averaging the six trees, it appears that it has taken 48 years to add the last inch in diameter to this forest. An annual increment of .02 of an inch is indeed slow growth. The trees are sound and healthy in appearance, but the crowns

of all are very small, mere brushes at the top.

This example is not an isolated case, but is representative of large tracts and serves to show of how little commercial importance these forests are.

They have, however, a high value as protective cover to these elevated regions where streams have origin. The soil is thin, gravelly, and not retentive of moisture, but the mat of roots in the soil, and the surface accumulation of leaves and branches, is sufficient to retard the flow of water and prevent destructive floods. The crowns and trunks, too, although not giving complete shade, have an appreciable influence in retarding the melting of snow accumulated during the winter.

It is only necessary to compare the well-wooded slopes with those that have been swept by fire, and denuded of soil by rapid rush of water, to fully illustrate the utility of these forests, and to show that there is reason in appeals for their protection from fire, and from all other depredations.

THE RUBBER INDUSTRY OF COSTA RICA.

By H. Stuart Hotchkiss.

AMONG the numerous industries that have opened up in Costa Rica during past years the rubber industry perhaps stands first in its capabilities for development. For a long time rubber has been exported in quantities that have varied exceedingly according to demand and to the inclination and ability of the Costa Ricans to collect it at points convenient for shipment to the markets of the world. Yet as the following figures (furnished by the National Bureau of Statistics in San José) indicate, the exportations of recent years have shown a steady and consistent increase; excepting 1900, when there was a slight falling off from 1899.

Exportations.

Years.	Kilograms.
1885	31.125
1886	9.918
1887	48.728
1888	11.388
1889	6.317
1890	10.197
1891	15.041
1892	28.561
1893	16.735
1894	9.822
1895	9.667
1896	16.741
1897	24.992
1898	49.639
1899	81.787
1900	72.197

With these general figures relating to the industry as a whole, it may be of interest to look a little more carefully into such details as the habits of the trees and the interesting attempts that have been made and are being made to cultivate them.

There are several orders of trees naturally indigenous in Costa Rica but foremost among them in commercial value are the *Siphonia elastica* and the *Castilloa elastica*. Their required environment is the same and their commercial value about at a par. However, as most of the experiments have been made with the latter, this is the one with which we will deal.

The *Castilloa elastica* is by nature a tree of the deep forests, feeding largely upon decomposed vegetable matter, and like all such, has most of its root system near the surface of the ground, although it also sends some roots deep into the soil to secure its position and enable it to absorb a greater amount of moisture. This moisture is essential for the *Castilloa* to attain its best growth, but as standing water seems to be detrimental we usually find it best developed where the drainage is good.

Like many other tropical trees whose wood is especially susceptible to decay, and which need protection when exposed, this

species produces the Caucho in a milky fluid capable of drying in a few hours into a more or less moisture-proof cap, which furnishes a first class protection to the wound.

Professor Pittier, of San José, who has made a study of the subject, states that "The Costa Rican rubber tree is generally met with on both the Atlantic and Pacific slopes to an altitude of about 2,400 feet, but that 2,000 feet would probably be the extreme upper limit of that tree, for profitable cultivation." It is very probable, however, that this last limit is too great as it is yet an open question whether plantations made where the natural growth is best, namely, from 800 feet down, will pay. But to return once more to the habits of the *Castilloa elastica* Growing among other trees and protected by their shade, the delicate bark is kept in the moist condition conducive to make of it the best possible conductor for the Caucho, while the roots find ample moisture, and the leaves, which rapidly push their way above the tops of their rivals, find an abundance of light to assure their rapid and healthy growth.

There is a curious belief among many Costa Ricans that the milk of the female tree is much richer in solid matter than that of the male tree, but where this idea could have come from is difficult to imagine, as the *Castilloa* is not a diœcious tree, that is, the male and female flowers are not on different individuals.

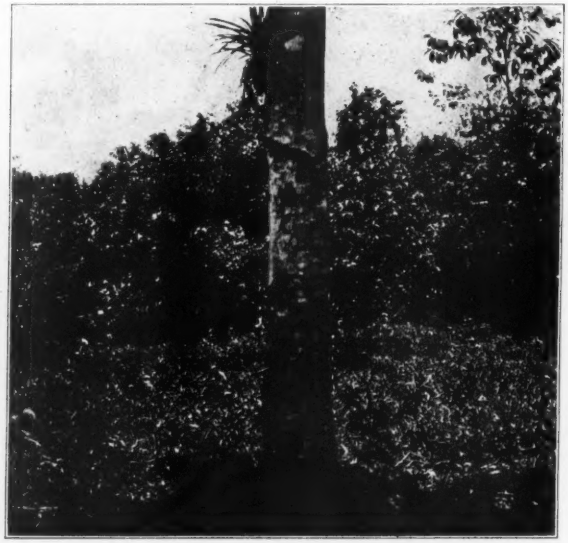
Like most other tropical vegetation the growth of this rubber tree is very rapid. In the first year it will reach a height of from three to five feet according to location, and many have been noticed that have attained a height of thirty feet in four years. These first four years represent the most rapid growth of the tree and from this point to the time they reach their maturity they increase their height with decreasing annular average until they reach their maximum height, which may roughly be placed at about sixty feet.

BED OF YOUNG TREES FOUR MONTHS OLD, BEFORE TRANSPLANTING.

Many interesting experiments in rubber cultivation have been tried throughout the world, but in Central America at least, no experiments of the past can be called decided successes. There are, however, some under way at the present time, that bid fair to yield better results than their predecessors.

Realizing the uncertainty of making a paying proposition out of a rubber plantation alone, most of the experiments have been made in connection with banana or cacao plantations. Of these the former would appear to offer the best chance of success because, it is invariably the case that where in nature you find the most luxuriant growth of *Castilloa* trees, there is the place to lay out your "bananal" with assured success. Of course the banana will grow (often profitably) in land unsuited to rubber, yet as a rule most of the great plantations have been reclaimed from land once thickly covered with trees of the latter variety, that have fallen prey to the ravages of the rubber thief, who in his attempt to get the most possible gum from the tree at one cutting, usually succeeds in killing it outright, or ruining it for a future yield.

On a banana plantation near Jimenez, Santa Clara Province, some experiments have been made that promise to give good results. In this case the cultivator has placed beds of young rubber trees planted about a foot apart in the most favorable places. When these attain a height of from eight to fifteen inches they are transplanted and scattered among the bananas at generous intervals and with the idea in mind to give them conditions as nearly like nature as possible. As many of their roots are very near the surface it is impossible to plough around them and thus keep them free from the weeds which sap their energy. This, however, is not a serious problem, as the shade afforded by the bananas, which is so necessary to the commercial condition of the rubber tree, serves effectually to suppress all of the less tolerant kinds of vegetation. It is found an



SHOWING METHOD OF CUTTING CASTILLOA. GUM ALLOWED TO COAGULATE ON THE TREE.

advantage to pile dead leaves and other refuse around the base of the tree from four to eight inches in height and to a distance of from two to three feet from the trunk; by this means the rains of a tropical summer are prevented from caking the clayey soil into a hard impenetrable mass and the worms, which are abundant, are brought to the surface, thus allowing the water to circulate freely through the holes that they have made and thereby dissolve those mineral properties essential to vegetable growth.

Near Port Limon on the coast many young rubber trees are grown merely for exportation and with no idea of tapping. These are grown among the cacao and when about a year old, are cut off just below the leaves, and the stems are packed in boxes, the layers being separated by a little dry earth. The market for this queer product is, I understand, Belgium whence they are reshipped to the Congo.

In the Talamanca district in southern Costa Rica the Indians have gained very favorable results by planting the trees in the forests in close imitation of nature and although they tax their vitality to the utmost by constant and severe bleeding, they are reported to derive a very respectable income from their venture.

Although the *Castilloa* is inferior to the *Henia* trees of the Amazon regions in many respects, both in the quantity and quality of the yield, yet I think we may safely look for a steady increase in the rubber trade in Costa Rica as the subject of cultivation becomes better understood, and the inhabitants learn to gather their product systematically and economically.

LAST ALLEGANY PINES.

THE last clump of Pine trees, the rear guard of the virgin forest that once covered the hills and valleys of Allegany County, N. Y., four hundred and ninety trees in all, have been sold for $7,500, probably the highest price ever paid in the State for that number of Pine trees on the stump. The trees have been for many years one of the sights of Southern Allegany County, and heretofore Lucius and Ebenezer Norton, the owners, have refused to put a price on them.

The Pines are on the hillside, in the town of Scio, seven miles east of Bolivar. During the last winter one-third of the trees have been cut away and the logs hauled to the mills at Belmont and Wellsville. In all, it is expected that the 490 trees will cut 720,000 feet of lumber. The price paid is over $15 a tree. The largest tree cut so far was over sixteen feet in circumference at the butt and the rings on the stump showed it to be over 295 years old.

Clear pine lumber is now worth $70 for each 1,000 feet. When the pioneers came to Allegany County their greatest trouble was to get rid of the pine forest and to get the land cleared. The virgin Pines were cut down, rolled into heaps and burned. The finest pine lands in the county for years went begging for buyers at $1 an acre. That was before the canal and the railroads came. During the last three years, since the great jump in lumber prices went into effect, every available piece of timber land in the county has been bought by the owners of portable mills and the lumber marketed, so there is to-day very little standing timber of any kind in the county. The telegraph companies have bought the Chestnut for poles, the railroads have bought the small Chestnut for fence posts and the Oak for ties, and the Hemlock has been cut off for lumber. In the oil-producing district lumber has to be shipped in and even wood for fuel is becoming scarce, while the price of heavy timbers for drilling rigs is advancing steadily. The mangle roller mills are working up all of the Maple that the forest worms did not destroy, and in ten years the farmer will wake up to the fact that he must burn coal for fuel because there will be nothing else to burn.—*The Buffalo Express.*

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Vol. VII. APRIL, 1901. No. 4.

Growth of Interest in Forestry. That the general public is coming to have a better appreciation of the value of forestry to the country at large events of the past few months suggest most forcibly. It has been but a few years since the forester was almost an object of pity. His warnings as to the wholesale destruction of our forests were often received with derision, and he was looked upon as a mild sort of a crank. Those were the days when our forests contained "an inexhaustible supply of timber."

With the enormous increase of business in this country during the last twenty-five years, especially in the lumber industry; the tremendous amount of forest products needed for home consumption, and the rapid increase in the exportation of lumber has suddenly brought many persons to realize that something must be done to insure the stability of our lumber supply.

It is this sudden awakening on the part of the people that will insure scientific forest methods a fair trial. The public is coming to know what forestry really is: that it is good sound business, not a fad; that forestry does not forbid the cutting of trees, but on the other hand, really means that more trees may be cut and at the same time insure the future production of the forest.

One of the most notable changes on the question of forestry is the attitude of lumbermen. At first they were suspicious of the forester and his methods, but at the present time lumbermen in every part of the country are showing a tendency to be guided by expert advice, and to cut their timber in a conservative manner looking to the perpetuation of the supply.

During the past winter there has been a notable amount of interest shown in forestry. The national government as well as the legislatures of a number of states have given forest measures careful consideration. Congress showed its appreciation of the government's position on the question of forestry by raising the Division of Forestry to a Bureau and more than doubling its appropriation for the coming year. The legislature of Pennsylvania voted to establish a Department of Forestry, and the same was done in Indiana. California by an almost unanimous vote of its legislature appropriated $250,000 for the purchase of the Redwoods in the Big Basin of the Santa Cruz mountains, and but recently Minnesota passed a law which sets aside delinquent tax lands as a part of the State Forest Reserve. In addition to the above measures the legislatures of Virginia, North Carolina, and Tennessee voted their consent to have the National government establish a forest reserve in the Southern Appalachian mountains within their several boundaries. New forest associations have been formed, and the work of the older organizations extended. The press throughout the country has evinced much interest in forestry and is responsible in a great measure for the rapid spread of knowledge regarding it.

The practice of forestry is good business; Americans are keen business men and once convinced of the value of a plan that energy so characteristic of them may be counted on to push it to a successful issue. There are decided indications that forestry is beginning to appeal to men as a sound business proposition, and there is reason to predict that within a few years

the practice of forestry in the United States will be carried forward on a very large scale. The education of the public to an appreciation of the value of forests will be the quickest and most effective way to accomplish their careful preservation.

The Fire Question. On another page will be found a list of forest fires that have been reported up to the time of going to press on this number of the FORESTER. The season of the year when forest fires are most likely to occur has scarcely arrived and yet in a month there is recorded severe fires in nine states, showing not only the usual loss in timber burned, but destruction of houses, barns, fences and in several cases even towns were in imminent danger of devastation.

From now until late autumn the chronicling of forest fires will be an almost daily occurrence. What this means the forester, the lumberman, the owner of timber lands and the lover of forests fully appreciates.

With these reports of forest fires will come cries from many quarters for fire legislation, and theories without number for the prevention of fires will be advanced. Candidly the fire question has been carefully studied by the most competent experts in the country and there is neither a lack of knowledge of fires and their origin, nor laws for the punishment of those responsible for them.

There appears two, effective—though not original—ways of controlling this ever recurring, and greatest enemy of our forests. The first is a proper enforcement of the existing fire laws; for on the statute books of nearly every state in the union will be found laws that if properly enforced would go a great way toward lessening the number of fires. The second is to educate the public mind to a proper appreciation of the value of forests and what a formidable and destructive enemy fire is to them.

In most cases the origin of a forest fire is not hard to determine. Sparks from a passing locomotive, carelessness on the part of farmers and settlers, in clearing land and burning brush, allowing the sparks and flames to escape to the woods; a half burned match or lighted cigar dropped while walking through the woods; the neglected camp fire of the hunter or camper; the burning over of lands by cattle and sheep owners to secure good pasture for the next season, or the vandal who sets fire to the woods for revenge; all these are well known causes of forest fires and in fact responsible for nearly all of such conflagrations.

Aside from the destruction of mature timber, and the killing of young growth, forest fires frequently menace human life. To show what havoc may be wrought by these fires it is only nesessary to recall several notable fires. The Miramichi fire in New Brunswick, which burned over an area of 2,000,000 acres, caused a loss of over 500 buildings and 160 lives. In 1871 Peshtigo, Wis., was destroyed by a forest fire, 2,000 square miles of territory were burned over, and between 1,200 and 1,500 people perished in the flames. A more recent disaster of this kind was the Hinckley, Minn., fire of 1894 in which 500 lives were lost and more than $25,000,000 worth of property destroyed. These are only a few of the worst cases.

A fire in New Jersey during the month of April was only prevented from destroying a town by the combined efforts of its residents. These examples serve to show what terrible havoc is possible from forest fires, and does not take into account the thousands of less important fires that occur annually, which, in the aggregate, destroy millions of dollars' worth of valuable timber and other property.

Let those charged with the administration of the laws see that they are rigidly enforced. A few years of such rule will impress the careless hunter or maliciously inclined persons, and fires will grow much less frequent. Meantime let the friends of our forests continue to teach the individual a true appreciation of their value to the community and there will be less necessity for the laws. When the public is thoroughly aroused to the importance of forests there will be aroused a public

spirit in favor of their preservation that will in itself be ample protection.

Forest Lands for Forest Purposes in Minnesota.

"An act to set apart and appropriate certain tax title lands for the State forestry purposes, and to provide for quieting the title thereto in the State, and to appropriate money for the expense thereof."

The foregoing is the title of an act recently passed by the Minnesota Legislature, whereby all lands title in which reverted to the State through delinquent taxes prior to 1891, and are unfit for agricultural purposes, are set apart for State forest purposes and are declared a part of the Forest Preserves of the State.

The act provides that only such lands as are totally unfit for agricultural purposes shall be set apart; and in addition before any lands are thus appropriated the proposition in regard to the same must be submitted to the Board of Commissioners of the county in which the lands are situated, who are to decide if such lands are unfit for agricultural purposes. One-half of the income from such lands will go to the State, one-fourth each to the town and county in which the land is situated.

The law requires the Attorney General to serve notice on delinquents informing them as to termination of the period of redemption; he is also charged with the duty of bringing action in the name of the State to quiet title to each tract of such land. Such actions shall be brought only at the written request of the Minnesota State Forestry Board. When titles in these lands are quieted they shall become a part of the Forest Reserve of the State, and are thereafter under the control, care and management of the State Forestry Board. This law goes into effect at once.

This law as it stands, though conservative, is a step forward in the movement looking to the preservation of the existing forests of Minnesota, and the reforestation of cutover lands. It is at least an opportunity for a practical start in state forest management. According to General C. C. Andrews there are nearly three million acres in Minnesota, in detached localities, of idle non-agricultural lands, which will begin to earn a good income as soon as they are forested. Under the new law much will depend on the opinions and decisions of the boards of commissioners of the several counties. There is a chance that the tracts of land thus secured for forest purposes will be so scattered that the State Board will be handicapped in their endeavors to produce the forests. However, this law marks the beginning of the redemption of waste lands through reforestation, and Minnesota has set an example in regard to derelict lands that several other states could follow with advantage.

It is a matter for regret that the resolution for a National Park in Minnesota, after passing both branches of the legislature by an almost unaminous vote should fail to receive concurrent action owing to the legislature adjourning before the matter was reached on the calendar.

NEWS, NOTES, AND COMMENT.

The Forest Fire Season.

That season of the year when we may expect, upon opening the newspapers, to see reports of forest fires, is at hand. Already there is a long list of such fires, reported from all sections of the country.

As early as March 4th the Cincinnati papers printed a dispatch from Columbia, Ky., which stated that "A forest fire raged west of this place yesterday, destroying thousands of panels of fence, and other property. Near Elroy, a forest fire burned the Mt. Pleasant Church and two large barns; near Dunnsville the old Taylor mansion and several large barns were also burned."

On the same date was reported a forest

BURNT WHITE PINE FOREST, PRIEST RIVER FOREST RESERVE IN IDAHO. - DESTRUCTION TOTAL.

fire near Parkersburg, W. Va., which destroyed 1,000 acres of fine timber, and for a time threatened the city itself, a rain storm finally stopping the fire. Flemingsburg, Ky., the same day was threatened by a forest fire and a number of barns were burned.

The town of Saratoga, La., on March 14th, was threatened with total destruction by a forest fire. A number of dwellings were burned. From Meridian, Miss., comes the news that forest fires have been sweeping over Lauderdale, Jasper and several adjoining counties, causing heavy damage to timber.

New Jersey had a big forest fire on April 1st, when the town of Winslow had a very narrow escape. Following is a local newspaper account of this fire: "One of the most extensive forest fires that have visited this section of the State is raging in the big woods north of this city. The fire reached a point just east of the town of Winslow last night, and for several hours it was feared the town would be wiped out. Men, women and children fought the flames and succeeded by back firing, in turning the flames to the north of the town. While the men threw up trenches to keep the fire away, women and children carried their household goods to places of safety in the fields and are guarding them, as a change in the wind is feared. Several farm buildings, about 5,000 acres of big timber, and thousands of cords of wood have been consumed. Many narrow escapes of the fire fighters have been reported."

Destructive forest fires during the first week in April raged in the Ramapo mountains, near Nyack, N. Y., causing heavy damage. In the same way many acres of valuable timber was destroyed at Deep River, Conn. In northern Michigan and the Cumberland Mountains of Tennessee, forest fires have been burning for a number of days. Great loss is feared, as the country in both regions is very dry.

Mining and Forestry. The Scranton (Pa.) *Tribune* makes some plain statements on the relation of mining and forestry. We quote the following from a recent editorial in that paper:

"More than twenty-five years ago an official of the Lehigh and Wilkes-Barre Coal company, while showing some of the mines and slopes of that company, and the then famous 'open-air coal quarry' where the great twenty-four-foot vein came out on a mountain side above the Wyoming Valley, had a word to say about forestry.

"No one in this part of the world was making any stir about forestation or reforestation, or the cultivation of the forests for commercial, agricultural and sanitary needs. The glorious woodlands that up to fifty, even forty years ago, had been one of the greatest prides of 'Picturesque Pennsylvania,' were being ruthlessly destroyed without any attempt to save the young timber or to replant the desolate spaces. It was all greed for the present without any care for the future.

"The official in question, as he explained the necessity of enormous use of timber in the mines to make them safe, and pointed it out as the party went through one of the mines, said regretfully: 'We have used up all the available pine timber of this section of the State, even that of Wayne County, and are obliged now to bring from beyond Williamsport, in Lycoming and adjacent counties, what we must have.' He indicated that it could, in the nature of things, be but a few years until all the primitive forests of this State should be sacrificed, and he deplored the folly from a commercial point of view of such destruction without adequate measures of reproduction and preservation.

"There are statements made sometimes that a mining—a mineral-producing—country has no such interests in forestry as has an agricultural region, but this is a mistake. They have begun to learn this lesson in the western ore-producing states, where many a rich 'find' has been left unworked for lack of timber and, with that, lack of water. 'The Comstock mines are the grave of the Sierras,' said one of the leading scientific explorers of this country years ago; and to-day California and Nevada are awaking

to the immense loss to themselves that has resulted. California is making efforts to repair the loss. Nevada is, to all intents and purposes, dead and can do nothing. Pennsylvania may well heed the lesson."

Agitation of Forestry in New Jersey.

It is to be hoped that the legislature of New Jersey will enact, at its next session, laws looking to the preservation of its remaining forests, and also to the reforestation of cut-over and burned timber lands. The New York *Sun* only a few days ago had the following to say on this subject editorially:

A BURNT PINE FOREST, SOUTHERN NEW JERSEY. THE FIRE, WHICH BURNT THE LEAVES FROM NEARLY ALL THE CROWNS, HAD PASSED LESS THAN TWENTY-FOUR HOURS BEFORE THE PICTURE WAS TAKEN.

"It is said that in his next message to the Legislature Gov. Voorhees of New Jersey will recommend State ownership of forests for the purpose of preserving them and dealing in lumber. An income of $500,000 a year could be derived from the system, it is estimated, and this amount might be applied to the reduction of the school tax. To the State Geological Survey is due the credit of the project. This commission is composed of the Governor, Col. Washington A. Roebling, ex-Senator Henry S. Little, who has given $500,000 to Princeton University; ex-Senator Edward C. Stokes, who has always been an advocate of strict economy in State affairs, and Lebrius B. Ward, an authority on water supply. The commission, in its work of collecting information about the forests of New Jersey and making a study of ways and means, has had the assistance of such experts as Mr. Gifford Pinchot, Chief of the United States Division of Forestry; Prof. Arthur Hollick, of Columbia University, and Dr. John Gifford, of Cornell. The last named made this report on the State forests: 'In the hands of private owners, under the circumstances which at present exist, the future of a large part of the forest land is not bright. A

change of some kind is necessary, and this must come either in the form of a change of ownership or of the circumstances which fetter ownership. The only way in which the ownership may be quickly and materially changed would be by State purchase.

"'Most of the forest land in New Jersey lies in the south and southeastern part of the State, consisting largely of pine growth, but there is a considerable area of miscellaneous timber in the northern part, along the New York border. Speculators have lately invaded the pine lands, bought districts at a low price, and established lumber camps to supply the railroad, telegraph and telephone companies with ties, logs and poles. The Geological Survey reports that landowners have been defrauded in some instances, and that the methods of the lumbermen are wasteful, no provision, such as replanting and care of second growth, being made for the future. At the present rate of timber cutting the supply might possibly last for forty years, but at the end of that time New Jersey would be denuded of its woods, unless attention had been paid to forestration.' Ex-Senator Stokes says: 'It may take some time to get action on the lines as contemplated, but if the people will study the subject carefully, and do a little figuring on their own account, they will see that it is a progressive twentieth century proposition. Germany derives an immense income from its forests. Why not New Jersey, when it has so much at stake? Let the State take this land, carefully cultivate it, prevent forest fires and wood stealing, and it would be but a short time till various wood-working factories would be established. With them would come small communities, and the quiet wilderness would wake up to the buzz of the saw and the shriek of the whistle.' The forest area of the southern counties is as follows: Ocean, 813,087 acres; Burlington, 303,777; Atlantic, 271,638; Cumberland, 166,264; Cape May, 80,851; Gloucester, 74,818; Camden, 66,588. or 1,797,003 acres out of the State total of 2,069,819. Professor Gifford is enthusiastic about the future of forestration in New Jersey under State control. He sees a profit not only in the sawmill industry, but in the cultivation of hard wood for chemical purposes and the exportation of charcoal, and in producing wood for pulp and celluloids.

"The proposal of the Geological Survey is certainly very attractive, but unless the people of the State are educated in the advantages to be derived from it, and they bring pressure to bear on the Legislature, the difficulties to be surmounted will try the faith of its sponsors. The speculators, which term no doubt includes powerful corporations, will send a lobby to Trenton to prevent enabling legislation, or to insure a handsome price for their holdings. To disparage the plan a cry will be raised that it is a job to benefit certain interests. Common sense, however, should win in the end."

Irrigation and Forest Preservation.

The following extract from an editorial in a recent issue of the Saratoga (Wyo.) *Sun*, shows a clear appreciation of the great benefits to be derived in that region from irrigation and proper preservation of forests:

"As soon as the people generally begin to see the benefits and importance of irrigation the question of forest preservation begins to take shape.

"Without forests to hold the snow and furnish water for irrigation that industry must fail, and with its failure a long train of disaster springs into existence. Every industry must suffer and decline. In this valley we are almost entirely dependent upon irrigation, for it furnishes hay, grain, vegetables, beef, poultry, eggs, butter and many other necessities of life. Without irrigation the stock industry would be practically wiped out. Without irrigation it would hardly be possible to work the valuable copper mines in the adjacent mountains, on account of the immense cost of transporting the necessities of life into the mining camps. At present the greater part of all the supplies used in every mining camp in either range is furnished by the ranchmen and farmers of this valley.

"Again, without an abundant supply

of water in our streams, there must be a large decrease, if not an entire extinction, of the fish which now swarm every water course flowing through this valley. It would be a severe blow, indeed, if our people were suddenly deprived of the food furnished by the trout which fill our streams and which have become such an important factor in our lives.

"If the broad and inviting prairies, which lie between the North Platte River and the mountains on either side, are to be brought under cultivation and made to furnish homes to the coming thousands; if these now barren acres are to perform their part in the great economy of life, it will be necessary that our forests be preserved and kept intact as natural reservoirs of water in the future, just as they have been in the past.

"The great and glowing future of this country depends largely on the protection of our forests from fire and depredations; it depends upon the construction of reservoirs and the promotion in every way of the irrigation question and Congress cannot too soon begin the active work of conserving our forests, appropriating money for the construction of reservoirs and in every way fostering the life of the arid West."

Tennessee and the Appalachian Forest Reserve. A bill has been passed by the Legislature of Tennessee ceding to the United States government as a part of the proposed Appalachian Forest Reserve, a strip of territory twenty miles wide along the North Carolina boundary excepting the mineral lands. This action on the part of the state of Tennessee gives additional weight to the question of creating an Appalachian Forest Reserve. Similar action was taken by the states of Virginia and North Carolina earlier in the year.

A VIEW OF THE NORTH PLATTE RIVER IN WYOMING. THIS RIVER FURNISHES WATER FOR A NUMBER OF IRRIGATION CANALS IN COLORADO, WYOMING AND NEBRASKA.

TYPICAL SANDS HILL IN WESTERN CHEYENNE COUNTY, NEBRASKA. SHOWS PRESENT CONDITION OF MUCH LAND IN THE MIDDLE WEST.

BLACK LOCUST FOREST PLANTATION, TWELVE YEARS OLD, IN MEADE COUNTY, KANSAS. TREES SIX TO EIGHT INCHES IN DIAMETER AND THIRTY FEET HIGH. SHOWS THAT FORESTS CAN BE PRODUCED ON THE NOW PRACTICALLY TREELESS LANDS OF THE MIDDLE WEST.

Summer Meeting of the American Forestry Association. A special summer meeting of the American Forestry Association will be held at Colorado Springs, Col., July 10, 11 and 12. There will also be a meeting of the National Irrigation Association at the same place, and immediately following. In the June FORESTER will be printed in full the arrangements for these meetings.

Dead, Down, and Green Timber Cutting. The Minneapolis *Journal* recently published the results of a private investigation into the logging operations on some of the Indian reservations during the past winter under the "dead and down" timber law. The *Journal* found, "that a considerable amount of green timber had been cut along with the dead and down timber that was supposed to be cut under the contracts."

The Mississippi Valley *Lumberman* of April 26th, makes the following comment on the matter: "Wherever the responsibility lies the fact remains that the lumber concerns that get the timber will have to pay the additional price demanded by the government for all green timber that went with the dead. So long as the farcical 'dead and down' timber bill remains on the statute books, and lumbermen can be found who are willing to contract for timber under its provisions, the government can expect the law to be violated. In the first place, however good the intentions of the loggers may be, it is impossible to get out the dead and down timber and not cut more or less green timber with it, and in the second place, the law itself offers temptations that few if any loggers can be found to resist.

"Few lumbermen who have experience in the work care to repeat it. The aim of the law is to give employment to the Indians and to give them a revenue from the sale of the timber. The well-known distaste of the red man for work defeats the first provision. Had the government made use of a system of espionage that would have prevented the cutting of green timber, the cost, in connection with the other necessary expenses would have used all of the small percentage that is supposed to be set aside for the Indian fund. As it is, the only man who makes anything out of the deal is the logger. The Indians get little or nothing, the manufacturers who get the logs pay more for the logging than the logs are worth, if only the dead and down timber is cut, and if obliged to pay the $13 per thousand asked by the government for all the green timber, they are also behind on that part of the deal.

"The men most interested in the perpetuation of the law are half breeds and the 'squaw men' who have done most of the logging. They are so interested that they not only cut 'dead and down' timber, but everything else they can get away with. For the most part they are irresponsible, and the green timber cut nets them as much for logging as the dead stuff, while the men for whom they log have to pay the price. Further than this, it is pretty well established that these men spend a considerable portion of their time when not employed in logging, in seeing to it that there will be plenty of 'dead and down' timber to log when next it is offered on the market. As a certain lumberman who has had experience under the law expressed it, 'No man can carry out a contract to cut "dead and down" timber and expect to go to heaven.' As long as this law is in force, the government is offering a premium to dishonesty and benefiting nobody. In the deals of the past winter, most of the lumbermen who contracted for timber were ignorant of the fact that green timber was being cut. When they received notice that they were expected to pay the exorbitant price demanded, there was no recourse. They must pay the price or give up the log. They had so much invested that there was no choice in the matter. They are losers, as a result, and when the government has more 'dead and down' timber to sell, they will not be among the bidders."

RECENT PUBLICATIONS.

Wilderness Ways. By WILLIAM J. LONG. Pp. 154. Illustrated. Ginn & Co., Boston, Mass.

This little volume of woodland sketches is the best book of its kind that has come to our notice. The author writes after years of observation of animals and birds in their native haunts, and the book is a most welcome relief in these days of thinking and talking animals in literature. It is clearly the work of a man who loves and understands nature.

Mr. Long writes well in a style finely adapted to the tales he tells. He is a true sportsman, too, seemingly taking as much interest in hunting with a camera as with a gun. The following quotation taken from the preface of "Wilderness Ways" reveals the opinions of the author and the spirit of the book: "Any animal is interesting enough as an animal, and has character enough of his own, without borrowing anything from man, as one may easily find out by watching long enough.

"Most wild creatures have but a small measure of gentleness in them, and that only by instinct and at short stated seasons. Hence I have given both sides and both kinds, the shadows and the lights, the savagery as well as the gentleness of the wilderness creatures.

"It were pleasanter, to be sure, especially when you have been deeply touched by some exquisite bit of animal devotion, to let it go at that, and to carry with you henceforth an ideal creature.

"But the whole truth is better—better for you, better for children—else personality becomes confused with mere animal individuality, and love turns to instinct, and sentiment vaporizes into sentimentality.

"This mother fox or fish-hawk here, this strong mother loon or lynx that to-day brings the quick moisture to your eyes by her utter devotion to the helpless little things which great Mother Nature gave her to care for, will to-morrow, when they are grown, drive thosesame little ones with savage treatment into the world to face its dangers alone, and will turn away from their sufferings thereafter with astounding indifference.

"It is well to remember this, and to give proper weight to the word, when we speak of the *love* of animals for their little ones."

The opening chapter on "Megaleep, The Wanderer," is an unusually fine study of the caribou and its habits. The book contains the following additional sketches: "Killooleet, Little Sweet-Voice"; "Kagax, the Bloodthirsty"; "Kookooskoos, Who Catches the Wrong Rat"; "Chigwooltz the Frog"; "Cloud Wings the Eagle"; "Upweekis the Shadow"; "Hukeem the Night Voice," and a glossary of Indian names. Lovers of nature will enjoy this book.

The **Mazama**, the official organ of the organization of that name, for April, is entitled the "Alaska number." The opening article is by Dr. B. E. Fernow on "Alaskan Attractions," while the "Harriman Alaska Expedition" is the title of an article by Trevor Kincaid. A valuable paper in this number is "The Flora of Mount Rainier," by Professor C. V. Piper. "The Explanation of an Indian Map," by Dr. George Davidson, a portrait of the late Henry Villard, and a short sketch and portrait of John Muir are other features of this interesting number.

The eighth annual outing of the Mazamas will take place in July, when Mount Hood will be visited.

Report of the Connecticut Agricultural Experiment Station for the year 1900. Part III. Pages 219-387. Plates XVI.

The contents of this report consist of articles on "Peach Foliage and Fungicides," "Literature of Plant Diseases," "Fertilizers for Forcing House Crops," "Chestnut Grafting," "Insect Notes," "Tobacco Experiments," "Protection of Shade Trees," "Cattle Foods."

The article on the "Protection of Shade Trees," by E. H. Jenkins and W. E. Britton, treats of the many enemies of shade trees, especially insects, and is well illustrated with a number of half-tone engravings.

PUBLICATIONS RECEIVED.

North American Willows. By W. W. ROWLEE. Reprinted from the Bulletin of the Torrey Botanical Club, 27.

Historic Trees of North America, I. The Washington Elm. Reprinted from the *Plant World*, Vol. II., no. 8.

Congres International de Sylviculture. Tenu à Paris du 4 au 7 Juin, 1900; Comte Rendu Détaillé. Ministère de l'Agriculture, Administration des Eaux et Forêts.

La Forêt: "Complement Indispensable de la Création." Roger Ducamp, Inspecteur adjoint des Eaux et forêsts. Extrait du Bulletin Minestriel de la Société forestrère de Franche Comté et Belfort.

The Windmill: Its Efficiency and Economic Use. By EDWARD CHARLES MURPHY. Being Nos. 41 and 42 of the "Water-Supply and Irrigation Papers" of the U. S. Geological Survey. Pp. 147. Plates XVI. Figures 70.

Conveyance of Water in Irrigation Canals, Flumes and Pipes. By SAMUEL FORTIER. No. 43 of the "Water-Supply and Irrigation Papers" of the U. S. Geological Survey. Pp. 86. Plates XV. Figures 27.

Fourth Annual Report of the Forest Preserve Board of New York. 1900. Pp. 140. Illustrated.

(To be reviewed later.)